

REMARKS

Claims 1-26 currently appear in this application. The Office Action of December 21, 2007, has been carefully studied. These claims define novel and unobvious subject matter under Sections 102 and 103 of 35 U.S.C., and therefore should be allowed. Applicant respectfully requests favorable reconsideration, entry of the present amendment, and formal allowance of the claims.

The Claimed Invention

As stated in the specification at page 2, lines 14-24, the process claimed herein makes it possible to perform an easy, selective and quantitative separation of a glyoxal diacetal obtained from acetalization of glyoxal with a monoalcohol from an aqueous reaction mixture that contains water, glyoxal, glyoxal monoacetal, glyoxal diacetal and water. In order for selective separation of the glyoxal diacetal to occur, all of the components of the reaction mixture of acetalization of glyoxal with a monoalcohol must be present. If all of these components are not present, the selective separation cannot be effected. Thus, the selective separation process is directed to separating glyoxal diacetal in a light phase, with a heavy phase containing all of the other constituents of the reaction mixture. That is, the

process is directed specifically to selective separation of glyoxal diacetal from the reaction mixture are recited herein.

Additionally, if there is no simultaneous presence of glyoxal monoacetal and glyoxal diacetal, or if water is removed during the reaction, or if a solvent other than water is used which does not allow for making use of different partition parameters for glyoxal monoacetal and glyoxal diacetal, there is no reason why one skilled in the art would achieve the presently claimed process.

One skilled in the art would only use the prior art processes, with the inherent problems of water removal, low yields, and the like, as described on page 2, lines 2-24.

Art Rejections

Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Babler, US 5,197,127 in view of Wessendorf et al., US 4,065,506.

This rejection is respectfully traversed.

Babler discloses a process for preparing chlorotrialkoxyethane comprising the following steps:

- a. forming a first reaction mixture in the presence of aqueous glyoxal of a catalytic amount of acid and of an alcohol;
- b. isolating glyoxal diacetal from the first reaction mixture;

- c. forming a second reaction mixture in the presence of glyoxal diacetal, a chloride reagent and a karyolitic amount of said aid; and
- d. isolating the chlorotrialkoxyethane thus formed from the chlorotrialkoxyethane.

As was explained in the amendment filed September 20, 2007, there is no disclosure in Example II of Babler as to the composition of the reaction mixture thus obtained. It is only mentioned at column 3, lines 8-10, that specific yields of biacetal given in the literature is approximately 80% when methanol is used. This is of paramount importance, as it is precisely the composition of the reaction mixture that is responsible for the problem of separating the desired product, and hence to develop the herein claimed solution.

The preparation of the crude reaction mixture of Babler, however, necessarily differs from that of the instant invention, in particular, in that, in the herein claimed process, water is not removed during the reaction, and non azeotropic solvent is used. Contrary to the Examiner's statement on page 4, second paragraph of the Office Action, Babler does not "necessarily teaches the presence of a glyoxal monoacetal of the formula (II), since Babler prepares the

glyoxal bis (diethyl acetal) in the same manner as the claimed glyoxal diacetal."

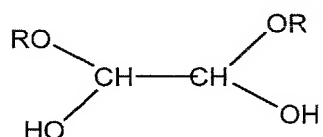
First, Babler uses methylene chloride as a solvent, not methanol. Second, removal of water, when performed in methanol, ensures a high conversion yield of glyoxal monoacetal into glyoxal diacetal, which is not the case when water is not removed. Therefore, the crucial aspect of selective separation according to the herein claimed process does not apply, because the desired product is in large excess with respect to the non-desired product.

It is likely that removal of water also has this effect when ethylene chloride is used. This is why there is no teaching to a skilled person that it is possible to selectively extract with a solvent a glyoxal diacetal from the reaction mixture containing the diacetal and a glyoxal monoacetal. Babler only teaches that it is possible to extract a glyoxal diacetal from an aqueous mixture with methylene chloride as the organic solvent. Since the reaction mixture of Babler is not the same as the reaction mixture for the herein claimed process, Babler is irrelevant to the presently claimed process.

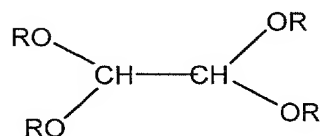
Wessendorf discloses a process for refining crude glyoxal solutions which comprises a step of semiacetalizing glyoxal solutions with a C₁-C₃ alcohol and a step of

continuously extracting, optionally countercurrentwise, the glyoxal semiacetal formed in the aqueous reaction mixture with an organic solvent which can be methylene chloride, cyclohexane or toluene.

It should be noted that the reaction mixture Wessendorf refines is not the same as that in the herein claimed process. Additionally, glyoxal semiacetals are structurally different from glyoxal diacetals. Glyoxal semiacetals have the following formula



while glyoxal diacetals have the formula



The herein claimed process relies on different partition parameters of products. Even though glyoxal diacetals and glyoxal monoacetals behave differently with respect to their solubility in a particular solvent and in water, they are structurally close. Therefore, it is impossible to infer from Wessendorf, which includes still another structure, how glyoxal diacetals and glyoxal

monoacetals will behave in the presence of semiacetals, particularly when countercurrent extraction is applied.

In addition, Wessendorf aims at removing by-products formed during the preparing of glyoxal by nitric oxidation of acetaldehyde, in particular, some acids of low volatility such as glyoxalic acid (column 1, lines 22-37). However, there is no suggestion in Wessendorf with respect to glyoxal monoacetals or diacetals.

Since the reaction mixture of Wessendorf has different components from the reaction mixture in the herein claimed process, Wessendorf is not pertinent to the presently claimed process.

Claims 1-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heydrich et al., US 2003/0069451 in view of Purves, US 2,194,405, Wessendorf et al., US 4,065,506 and Babler, US 5,191,912 and further in view of Van Dijck, US 2,081,719.

This rejection is respectfully traversed. The European counterpart of Heydrich, EP 1 300 383, has been duly considered in the written opinion issued by the International Search Authority (ISA) of PCT/FR2004/001224, from which the present application derives. The European version of Heydrich is also cited in the present application at page 2, lines 2-5. Heydrich discloses a process for preparing glyoxal diacetals

by reacting aqueous glyoxal with monovalent alcohols. After distillation to remove excess alcohol, glyoxal diacetals are separated by azeotropic distillation with water. A second azeotropic distillation is performed in order to obtain anhydrous diacetals. Heydrich neither teaches nor suggests a countercurrent liquid-liquid extraction.

Furthermore, as acknowledged in the written opinion issued by the ISA, the claimed process relies on the fact that glyoxal diacetals and glyoxal monoacetals surprisingly show different partition behavior with respect to the aqueous phase and the non-miscible solvent. This implies that, in the final reaction mixture, all of the components are still present.

The Examiner is correct in stating that Heydrich does not address this fact, as Heydrich only teaches that glyoxal diacetal is recovered in a conventional manner.

Purves does not cure the deficiency in Heydrich, because Purves relates to a process for preparing glyoxal tetra-acetals involving reacting glyoxal sulfate with an anhydrous alcohol, where the reaction is conducted in the presence of a metal salt yielding an insoluble sulfate in the presence of sulfuric acid. Purves does not disclose any of the components of the aqueous reaction mixture from which the herein claimed process aims for selectively separating glyoxal diacetal.

As stated above, the extraction process relies on the specific behavior of specific compounds with respect to specific solvents. Therefore, it is clear that one skilled in the art would not find any teaching in Purves that relates to the herein claimed process.

Babler has been discussed above, and has been found not to be relevant to separation from the present reaction medium. Van Dijck adds nothing to the cited references, because Van Dijck only discloses that countercurrent extraction is a known extraction method.

None of the cited patents, alone or in combination, teaches or suggests selective extraction of glyoxal monoacetals and glyoxal diacetals from a reaction mixture containing the glyoxal monoacetals and glyoxal diacetals to obtain a light phase containing a glyoxal diacetal and a heavy phase including all of the other constituents of the crude reaction mixture.

In view of the above, it is respectfully submitted that the claims are now in condition for allowance, and favorable action thereon is earnestly solicited.

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Amd. dated May 20, 2008
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Respectfully submitted,

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